FINAL REPORT

The Reduction of Wildlife Mortality

in

The Sump Pits

of

Southeast New Mexico

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by

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Abstract

From the 1950's to 1981 approximately 450,000 vertebrate wildlife, mostly birds, were killed anually in the sump pits of southeast New Mexico. In 1981 the Minerals Management Service (MMS), now a portion of the Bureau of Land Management, instituted a cleanup of those pits on Federal lands. The operators either screened them over or filled in the pits. This was about half the pits in southeast New Mexico, the rest being on fee land or lands owned by the State of New Mexico and administered by the Oil Conservation Division.

MMS's action saved approximately 225,000 birds and other wildlife annually.

THE REDUCTION OF WILDLIFE MORTALITY IN THE SUMP PITS OF SOUTHEAST NEW MEXICO

History

One of the greatest causes of unnatural mortality of wildlife in southeast New Mexico is that caused by the waste disposal pits (sump, sludge, emergency, etc.) used by the oil and gas industry. Most sump pits were developed from brine water pits where many of the early pioneering oil men disposed of the water produced with the oil. The majority of the pits were constructed in the 1940s and '50s. The earlier oil producers usually dumped their brine, mixed with oil on the ground, in playas, or in ditches in the fields. The later producers have tended toward sub-surface injection.

The brine dumped in these pits was almost clear, with just a trace of oil in it. Once in the pit, the oil floated and the brine percolated into the ground, gradually increasing the percentage of oil on the surface. It is not unusual for a pit to build up over eight feet of oil over the years. Of course, some operators dumped their tank bottoms into the pits, thereby making an even oilier mess.

Right from the start, there were wildlife deaths, mostly birds, associated with oil and gas exploration and development. Animals were always blundering intc the sticky messes of oil left around. Environmental protection was not particularly important in those days.

This is not a problem exclusive to New Mexico. It has been reported in most areas of oil and gas development. Flickinger (1981) has investigated this mortality in east Texas. Rold (1970) has reported this problem in Colorado. The media has also written much on this problem--Tessier (1980), Vogler (1978), Biffle (1979), Partain (1978), Modisett (1979), Belanger (1979), and Wise (1981).

Avian mortality in the oil sump pits of the San Joaquin Valley of California was estimated at 150,000 birds annually (Anon. 1973). Banks (1979) felt that the national mortality was at least 10 times the San Joaquin mortality and used this as a low, very conservative National estimate of bird deaths.

In 1974, Bureau of Land Management biologist John Schwarz noted 42 dead animals in and around 12 sump pits in the Cato oil field. Subsequent examinations revealed further mortality. The BLM, responsible for environmental protection, notified the U.S. Geological Survey, responsible for oilfield production. Differing agency priorities slowed the oilfield cleanup, but in 1975, covering was required over the sump pits in the known lesser prairie chicken (Tympanuchus pallidinctus) range. The prairie chicken was on the U.S. Fish and Wildlife Service's Threatened List at the time. The Cato Oil Field was cleaned up in 1980.

In the meantime, other BLM biologists were discovering wildlife mortality in every older oilfield in southeast New Mexico. While a few waste oil and water disposal pits are occasionally still built, most of the

newer wells use more modern methods of disposal. Again, differing agency priorities got in the way of an oilfield cleanup. I began seeking means of developing an estimate of wildlife deaths in all of southeast New Mexico.

Increased BLM pressure, along with the preliminary estimates from my study, jolted USGS into action. Initially, they gave their operators written notification that the pits were to be cleaned up in six months. After the time expired, they sent their operators another similar letter. After the second letter expired, in 1981, USGS (now Minerals Management Service) began fining their operators $25 per pit per day. Within two weeks, the pits were cleaned up.

We still find the occasional pit on Public Land. We simply notify M.M.S. (now a portion of B.L.M.) and the pit is cleaned up, by the means previously described. The few new pits are covered with wire netting during construction.

Unfortunately, only approximately half the pits were on public land. The other half are on private land and New Mexico State Land. Oil production on this land is administered by the N.M. Oil Conservation Division. The term "conservation" means optimum oil recovery. It has nothing to do with environmental protection. The sump pits are still present on this land. They are still entrapping wildlife. The estimates which I have developed to help in the clean-up of the public lands are still relevant off public land.

Methods

Total sump pits -

The New Mexico Surface Impoundment Assessment estimates the number of waste disposal pits at 16,000. They actually located 15,761. This is a state-wide estimate. Also, some of the pits they counted had only brine in them, no oil, so I decided to make my own estimate.

I determined the number of waste disposal pits from aerial photographs. I counted 5649 pits with oil in them in southeast New Mexico. Oil covered pits showed up much darker than, for example, livestock watering facilities, which are also common in the area. They are also usually rectangular in shape and in association with oil wells. These pits varied greatly in size. Some of the large pits were as large as 10 acres and the smallest about 20 square feet. Most, however, were between 700 to 1000 square feet in area. At least 2 playas were polluted in this manner, but they were not counted.

Sump pits visited -

I visited 370 sump pits. The pits were simply those I was working near. While some of these pits were on state or private land, I generally avoided large tracts of state and private land since my work did not take me there.

On these pits I recorded the numbers and type (swimming bird, songbird, bat, etc.) of animal found, the location of the carcasses in relation to the edge of the pit (availability to scavengers), and the approximate liquid weight, liquid depth, date, location, and oil depth (skim, etc.). I also made observations and engaged in discussions with oilfield personnel in order to find a remedy for these problems and learn of other problem areas.

During this time, I maintained close contact with Ed Flickinger of the U.S. Fish and Wildlife Service, Patuxent Wildlife Research Center, Gulf Coast Field Station, Victoria, Texas. He was conducting similar research near Victoria and we both were able to benefit from discussing mutual problems.

I also initiated a detailed study of 14 sump pits. I chose these pits simply by the fact that I knew dates at which birds became entrapped in these pits. These 14 pits were also fairly close together, which made it easy to visit them all in a single day. Generally, I visited these pits every other day.

I was also able to establish the date of entrapment on 168 vertebrate animals, both from the detailed study and the regular inventory. Many of these animals were still alive.

Results

I found 499 vertebrate animals killed by the sump pits. Most were birds, but all orders except fishes were represented. They were found at all times of the year, but losses were especially heavy at certain times.

Generally, these wildlife losses followed two patterns. In the summer, most of the losses were young, inexperienced, recently fledged or weaned wildlife. Almost all were songbirds, doves, bats, or cottontail rabbits.

The birds and bats were usually feeding on trapped insects while, I assume, the rabbits were looking for a drink. In one instance a pyrrhuloxia's oily tracks showed where he waded into a sump pit to extract grasshoppers twice. On the third try he drowned.

The other pattern was fall losses of ducks and shorebirds, especially in areas where there is little natural surface water. Raptors were often trapped when they attempted to prey upon the struggling animal. In one instance, I extracted a hawk hanging on to a duck. In another case, an entire flock of longspurs was lost when they landed in a tar pit. They were probably attracted by the seeds which were readily visible on the tar.

In most cases, animals that succeeded in getting out of the pit were scavenged by predators, often coyotes (Canis latrans). The predators also ate any animal in the pit they could reach from the bank. With small animals, the coyote usually stripped the skin from the carcass and

ate the whole animal. With the larger carcasses, like ducks, the coyote normally laid back the skin over the breast and ate whatever he wished.

Because of this, the smaller scavenged carcasses soon disappeared, while the larger ones remained for a long period. Since the predator ingested some oil with his meal, he would sooner or later die from this scavenging (Kerr and Edwards - 1981).

The predators appeared to scavenge their particular pits every week to 10 days. About half the pits were scavenged by coyotes. Bobcats have also been observed scavenging.

In some cases, the pit bottoms were readily visible. Usually this occurred when the operator dumped the oily waste from the bottom of his storage tank into a depression in the ground. This tarlike sludge sat there attracting insects, which in turn attracted birds. They were stuck there, easily visible, until the operator dumped more sludge into the pit when they were covered up. While this time varies from two weeks to two years, the average time seems to be a year.

When a bird or other animal lands in a pit with only a skim of oil on it, it does not readily sink. Many of them struggle to the banks, where they are scavenged by coyotes. Others, perhaps landing in an area of the pit where there is little or no oil, recognize the hazard and fly off before their feathers are badly fouled. Their eggs will suffer from reduced hatchability if this happens in or near the nesting season.

If their feathers are fouled by the oil and the bird dies, it floats on top of the brine, but under the oil. Its body shape is usually readily visible. Or if it does sink, it refloats when the gases in its body expand. It eventually sinks when the body has disintegrated sufficiently to permit the gases to escape. The final sinking normally happens in the summer or during warm spells in the winter. Depending upon the warmth of the liquid and the size of the animal, it sinks in about four weeks in the summer or four months in the winter.

Other animals landed in pits with considerable oil in them. In this case, the animals, once they sink the first time, usually do not refloat. Since different oils have different specific gravities, this is not necessarily true elsewhere.

The sinking time varies as to size and weather. In the summer, some songbirds sank immediately, while others took up to four days in the winter. Aquatic birds always took longer, from a week in hot weather to three and more in the cold.

In a similar test in East Texas, very similar results are being obtained, (Personal communication, Flickinger, U.S. Fish and Wildlife Service). The major difference is that he is using dead birds left over from other studies. THey are thrown in the pit. All the songbirds have sunk within a day, the smaller ones within 15 minutes. All the songbirds also refloated. The fact that the birds were already dead may have had a bearing on this last difference. LIve birds, in their struggle to escape, may have emptied their lungs and guts and have been less likely to refloat.

Mortality Estimate

The average numbers of wildlife killed in southeast New Mexico from the sump pits was estimated at approximately 450,000 annually from the 1950's to the 1981 cleanup. Prior to that, the kill from the oil and gas industry was probably worse, judging from the descriptions given in historical literature. Many of the oilfield personnel interviewed told of wading through two inches of oil covering up to ten acres, in order to service a problem well.

Since the numbers of sump pits on public lands were about half of the total, the estimated present kill is approximately 225,000. This is almost completely on private and New Mexico State-owned lands. All indications are that West Texas was always and still is considerably worse.

Those estimates are probably lower than the actual kill. At least three oil companies remove birds when they find them to avoid adverse publicity. Of the animals found, 37% were songbirds, mostly mockingbirds (Mimus polyglottos), pyrrhuloxia (Cardinalis sinuatus), and western kingbirds (Tyrannus verticalis) in the summer, and sparrows and longspurs in the winter. Another 33% were ducks. Doves and quail made up 11% of the mortality. Eight percent were sandpipers and herons and 5% were raptors. Bats were 4% of the carcasses. Rodents and rabbits made up 1%, as did reptiles and amphibians.

A few of the birds were on various State and Federal Endangered Species lists, including the bald eagle (Haliaeetus leucocaphalus). A list of species found by me and my associates in this area is in the appendix.

Other Problems

While animals as large as cows occasionally become entrapped in the sump pits, the usual cause of livestock, big game, and predator deaths is poisoning from ingesting the contents of the pits. Both livestock and big game will eat the pit contents whenever the fencing is down, possibly being attracted by the salty taste. Predators become poisoned from scavenging. At least some of the area ranchers, when they find a cow, who has ingested brine from a pit, immediately sell it to a butcher shop. I have no idea of the effect on human health.

When an oiled bird escapes from a sump pit, he is then beset by a number of other problems. If he cannot clean his feathers sufficiently to fly, he will be eaten by a predator. If he can clean his feathers and fly, he may have ingested enough oil to kill him (Hartung and Hunt, 1966). If the oil did not kill the bird, he may suffer from sub-lethal effects that may reduce the bird's capacity for long-term survival (Miller, et al, 1978). Also, females ingesting sub-lethal doses have an altered yolk structure in their eggs, which reduces hatchability (Grau, et al, 1977). At Patuxent, in a test simulating a mother duck returning to her nest with oil on her breast, eggs also suffered reduced hatchability (Bioscience, 1976).

Conclusions

The obvious conclusion was to clean up the sump pits. Several methods were used. An estimated 225,000 vertebrate animals are being saved annually.

In many cases the pits were no longer necessary; these were usually filled in with a bulldozer. This is actually a poor method, since the oil will eventually rise to the surface and cause wildlife mortality all over again.

During the cleanup, one pit was struck by lightning and burned. A fire department 30 miles away saw the smoke and responded. After the excitement was over, a lot of other pits in the vicinity were "accidently" burned. While this may be a Clean Air Act violation, it is cheap and solves the problem very well.

Many of those pits still being used were covered with hardware cloth. In some pits, a person can remove the oil skim with a rake in cold weather.

The best method of cleanup, however, is to commercially utilize the material in the pit. In East Texas, Flickinger (1981) found styrene-tar from sump pits was recycled for the recovery of ethyl benzene, toluene, cumene, and fuel oil. In the same study sump pits were drained and used for treating railroad ties. Removal of the paraffin from the waste petroleum will usually make the petroleum saleable to a refinery. The paraffin can be sold to a candle manufacturer. Other uses include a dust pallative for roads, and a preservative for wooden posts. A vacuum truck/separator has been developed at Texas A & M University and is in use in certain oil fields. Storing this waste in Fiberglass or metal tanks also makes recovery easier. Certainly, it does not make sense to waste a natural resource and kill wildlife with it as well.

APPENDIX

Calculations

$X = \frac{168 \text{ Freshly entrapped animals}}{746 \text{ pit visits}}$

$X = .225$ animals/day/pit

$.225 \times 365 \text{ days} \times 5649 \text{ pits} = 463,924$

463,924 = annual vertebrate animal kill in southeast New Mexico.

$$SD = \sqrt{\frac{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}{n - 1}}$$

$$SD = \sqrt{\frac{958 - \frac{(168)^2}{746}}{745}}$$

$SD = 1.1326$

$$SE = \frac{SD}{\sqrt{n}} = \frac{1.1326}{\sqrt{746}} = .041467$$

$$SE\% = \frac{\frac{SE}{\bar{x}}}{} \times 100 = \frac{.041467}{.225} \times 100$$

$SE\% = 18.43\%$

Probability

Sample mean is within 18.43% of the true mean 68.3 times out of 100. (424,857 - 549,425)

or

Sample mean is within 36.86% of the true mean 95.4 times out of 100. (292,922 - 634,926).

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CHECKLIST - SPECIES FOUND IN SUMP PITS

Amphibians

Red Spotted Toad
Plains Spadefoot

Reptiles

Collared Lizard
Side-blotched Lizard
Gopher Snake

Birds

Pied-billed Grebe
Snow Goose
Mallard
Gadwall
American Widgeon
Shoveler
Cinnamon Teal
Lesser Scaup
Ruddy Duck
Mississippi Kite (NM Endangered)
Marsh Hawk
Red-tailed Hawk
Golden Eagle
Bald Eagle (U.S. Endangered)
American Kestrel
Lesser Prairie Chicken
Scaled Quail
Snowy Egret
Great Blue Heron
Green Heron
Black-crowned Night Heron
American Coot
Killdeer
Lesser Yellowlegs
Mourning Dove
Roadrunner
Lesser Nighthawk
Western Kingbird
Ash-throated Flycatcher
Say's Phoebe
Horned Lark
Chihuahuan Raven
Mockingbird
Loggerhead Shrike
Western Meadowlard
Pyrrhuloxia
Lark Bunting
Lark Sparrow
Cassins Sparrow

White-crowned Sparrow
McCown's Longspur (N.M. Endangered)
Smith's Longspur

MAMMALS

Mexican Free-tailed Bat
Silver-haired Bat
Hoary Bat
Hispid Cotton Rat
Desert Cottontail
Hereford Cow